



## HH 60 HF HARDSURFACING

AC/DC REVERSE OR AC ELECTRODE

### General Characteristics

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HH 60 HF is a very good, economical hardsurfacing electrode that can be used in all positions. This electrode has a specially designed flux that allows it to run as easy as low hydrogen electrodes. It is excellent for applications where impact and abrasion are a problem. The deposited weld metal is porosity free. This electrode can be used with multiple passes, up to three, without cracking or spalling. Can be used equally well on carbon and manganese steels.

### Procedure

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Clean the welding zone free from oil, rust and other contaminants. Keep the arc as short as possible. Hold the electrode in a slightly inclined position. Use stringer beads on most applications, however a weave bead of 3 times the electrode diameter is recommended to build-up with HH 38 HF on carbon steel or HH 277 MANG for alloy and manganese steels, then put the final layers of HH 60 HF on top, up to three (3) passes.

### Application

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For final overlays on crusher rolls, bucket teeth, impellers, mixer paddles, percussive drilling tools, bucket lips, grader blades, and mill hammers where heavy impact is a problem. Use on construction and mining equipment and also applying top layers over build-up on hard manganese steel machinery parts. If high abrasion with some impact is the problem, then HH 163 HF or HH 610 HF should be used.

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Hardness (R.C)	56-60
Wear Coefficient	2.8%

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Diameter (inch)	1/8	5/32	3/16
(mm)	3.25	4.0	5.0

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Amps (approx.)	100-130	150-190	180-220
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## HH 40 HF HARDSURFACING

DC REVERSE OR AC ELECTRODE

### General Characteristics

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HH 40 HF is a high alloy electrode for joining and build-up of Austenitic Manganese Steels for extreme impact resistance. This alloy is for joining and rebuilding manganese parts. The high alloy deposits are very tough and will take extreme impact especially in the work hardened condition. This electrode has excellent weldability with very low spatter. Can be used in all positions.

### Procedure

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Clean the welding zone free from oil, rust and other contaminants. Maintain a short to medium arc and weave slightly to obtain a smooth even deposit. Deposit 3 to 4 inches at a time to minimize heat input. Skip welding technique is advisable on large components. It is recommended to keep the manganese part being welded below 500° F, so that the structure of the manganese base metal is not altered. Allow welded parts to cool slowly.

### Application

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For build-up and joining of manganese parts, such as crusher rolls, dipper lips and teeth, dredge pump parts, crusher jaws, shovel pads, and any other parts of heavy equipment that are austenitic manganese steel.

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Hardness (RC) (as deposited)	16-19
Hardness (RC) (work hardened)	48-50

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Diameter (inch)	1/8	5/32	3/16	1/4
(mm)	3.25	4.0	5.0	6.0

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Amps (approx.)	110-135	125-190	150-220	190-250
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## HH 63 HF CHROMIUM CARBIDE HARDSURFACING

DC REVERSE OR AC ELECTRODE

### General Characteristics

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HH63 HF is a high speed chromium carbide hardsurfacing allow with 33% chrome content, and an alloyed core wire that has unmatched abrasive wear resistance on both heavy and light parts. The special metallic coating provides excellent welding performance, which permits obtaining a smooth surface. Despite high hardness, the deposit retains its toughness and wide weaving to 3 times the electrode size may be used without cracking. The deposit is machinable only by grinding. This electrode has tremendous edge control, and may be used on edges as thin as 1/2 inch without burn off. The high chromium content makes the weld deposits maintain their resistance to wear even at elevated temperatures.

### Procedure

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Clean the weld zone zone of all contaminants and remove previous hardsurfacing deposits by using HH 8 CHAMFER gouging rod. Another method would be to overlay previous hardsurfacing with HH 207 MANG, to give a good base to put additional hardsurfacing onto. A 2 layer deposit is recommended where possible to give the best possible wear resistance. Do not exceed the 2 layer deposit due to the chance of weld deposit cracking. The electrode deposits by spray type arc transfer. Maintain a long arc when welding for best results.

### Application

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For final overlays on parts subject to severe abrasion with some impact such as equipment for processing soil, rock, coal, cement, and ceramic matter. Use on dredger teeth, conveyer screws, asphalt augers, agitators, earth augers, and scrapers. Also used for surfaces that must resist abrasion combined with scaling such as open-hearth tools, grates, conveying chains in annealing furnaces, and manipulators. If extreme abrasion without impact is the problem, then the recommended electrode would be HH 65 HF, which gives a higher hardness, and takes little impact.

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Hardness (RC)	58-63
Wear Coefficient	2.0%

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Diameter (inch)	3/32	1/8	5/32	3/16
(mm)	2.5	3.25	4.0	5.0

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Amps (approx.)	65-95	110-140	130-170	160-220
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## HH 65 HF CHROMIUM-NIOBIUM HARDSURFACING

DC REVERSE OR AC ELECTRODE

### General Characteristics

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HH 65 HF is a unique combination of carbides in a homogeneous deposit that is used for extreme abrasion resistance. This electrode is a combination of chromium, molybdenum, vanadium, niobium and tungsten with a high carbon content that allows it to form a tight carbide structure that offers the ultimate combination of abrasion resistance and high temperature hardness retention. HH65 HF maintains its hardness up to 1600°F (860°C), and the electrode produces a deposit that leaves very little slag which means more deposit for the money. Has metal recovery of over 190%.

### Procedure

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Clean the weld zone of all contaminants and remove previous hardsurfacing deposits by using HH 8 CHAMFER gouging rod. Another method would be to overlay previous hardsurfacing with HH 207 MANG, to give a good base to put additional hardsurfacing onto. Use a medium arc gap for best results. A 2 layer deposit is recommended where possible to give the best possible wear resistance. Do not exceed the 2 layer deposit due to the chance of weld deposit cracking. Deposits should be put down in stringer beads or large dot pattern. This electrode will cross check to stress relieve itself. This is normal with high hardness electrodes. Crack sensitive material should be preheated to 750-903° F (400-500°C) prior to welding.

### Application

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For final overlays on parts operating under extremely severe conditions such as fine particle abrasion found in the cement and brick industries. Excellent for sliding mineral wear with low to medium shock loads. Used on items handling hot coke, slag, and sinter-handling equipment. This electrode is for extreme abrasion and will take little impact.

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Hardness (RC) 1st Pass	64-66
2nd Pass	66-68
Wear Coefficient	0.5%

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Diameter (inch)	1/8	5/32	3/16
(mm)	3.25	4.0	5.0

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Amps (approx.)	105-135	130-170	170-240
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## HH 610 HF CHROME-MOLY-TUNGSTEN HARDSURFACING

DC REVERSE OR AC ELECTRODE

### General Characteristics

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HH 610 HF is a high chromium-tungsten-molybdenum iron based hardsurfacing electrode that is used for surfacing parts subject to high abrasion with moderate impact. Although the deposit has high hardness, it will take moderate impact and will maintain its hardness up to a temperature of 1000° F. It is very easy to apply and has equally good welding properties for ease of application. Machinable by grinding only.

### Procedure

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Clean the weld zone of all contaminants and remove previous hardsurfacing deposits by using HH 8 CHAMFER gouging rod. Another method would be to overlay previous hardsurfacing with HH 207 MANG, to give a good base to put additional hardsurfacing onto. Use a medium arc gap for best results. A 1 layer deposit is recommended where possible to give the best possible wear resistance. Do not exceed a 2 layer deposit due to the chance of weld deposit cracking. Deposits should be put down in stringer beads. This electrode will cross check to stress relieve itself. This is normal with high hardness electrodes. Crack sensitive material such as alloy type steels should be preheated to 750-903° F (400-500°C) prior to welding.

### Application

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For final overlays on parts operating under extremely severe abrasion conditions such as fine particle abrasion with some impact including crusher parts, coke pusher shoes, ash fan blades, feed mill hammers, bucket lops and teeth. Also used in higher heat applications such as steel mill blast furnance bells, hot slag dipper teeth and pug mill paddles.

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Hardness (RC) 1st Pass	60-65
Wear Coefficient	1.5%

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Diameter (inch)	1/8	5/32	3/16
(mm)	3.25	4.0	5.0

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Amps (approx.)	90-130	270-230	175-275
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## HH 38 HF BUILD-UP FOR CARBON STEEL

DC REVERSE OR AC ELECTRODE

### General Characteristics

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HH 38 HF is a special build-up and underlay alloy, which is non-cracking and wear resistant, used on carbon steels up to .4 carbon content. This electrode is used as an economical build-up on surfaces subject to severe impact loads and metal to metal wear. The special coating produces a fast flowing weldment with a stable arc, free from spatter and an easily removable slag. It provides perfect fusion with the base metal, and the beads are smooth and non-porous. The weld metal can be machined and forged.

### Procedure

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Clean the welding zone free from oil, rust and other contaminants. Parent materials that are susceptible to cracking such as cast steel and higher carbon steels, should be preheated to around 250° C (500° F). Maintain a short arc when welding using stringer beads when possible, however a weave of 3 times the diameter of the core wire may be used when building up large areas. Any number of layers may be deposited on top of each other provided that the flux is well chipped off between passes to make sure that there are no slag inclusions.

### Application

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For build-up on gears, couplings, shafts, tractor rollers, idlers, and sprockets, track wheels, and trencher bucket segments. Ideal for welding worn surfaces of carbon steels, such as rail ends, and carbon steel switch points, or as an underlay on any type of carbon steel prior to hardsurfacing.

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Hardness (RC) 1st Pass

33-38

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Diameter (inch)  
(mm)

1/8	5/32	3/16	1/4
3.25	4.0	5.0	6.0

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Amps (approx.)

80-110	140-160	160-190	180-220
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## HH TUBE TUNGSTEN THF HARDSURFACING

GLASS ROD OR ELECTRODE DC REVERSE

### General Characteristics

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HH Tube Tungsten THF is an extremely wear and abrasion resistant macrocrystalline tungsten carbide arc and gas rod. This product is designed for ultimate wear resistance caused by abrasion, and has a uniform microstructure, meaning that the carbide particles do not sink in the weld metal, but stay uniform throughout the deposit from top to bottom. The gas rod is in a very hard alloy steel matrix tube that has excellent flow and a smooth, medium bead profile. The arc electrode has a dipped coating that leaves slag free deposits with unusually high wear resistance. Both the arc and gas rods have a 60% tungsten content, which gives the highest wear resistance available.

### Procedure

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Clean the weld zone of all contaminants. The surface to be hardsurfaced should be relatively smooth and uniform. Old hardsurfacing deposits should be removed prior to new deposits being put on, otherwise the deposit may break out. Keep rods and electrodes dry, as moisture can cause porosity. It is necessary to preheat high carbon and alloy steels to 500° F to help avoid under-bead cracking and failure by spalling. Normally a tungsten deposit will exhibit cross checking. This is desirable as a means of stress relief.

### Application

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Used to hard surface mixer blades/paddles, conveyor sprockets, impellers, tamping tools, pulverizing hammers, feed screws, pug mill knives, mill guides, Muller plows, dozer blades, dragline buckets, slurry pumps, scraper blades, cultivator tines, earth boring augers, oil field bits, ditch cutters and tillage tools. Can be used successfully on any part that is subject to extreme abrasion without impact. This product takes very little impact.

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Hardness (RC) (Matrix)	58-62
Tungsten Carbide Hardness	88-92 Rockwell A or 9-10 Moh's
Wear Coefficient	0.2%

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Diameter (inch)	1/8	5/32	3/16
(mm)	3.25	4.0	5.0

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Amps (approx.)	80-110	115-130	155-185
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